01296

Printed Pages – 6 **MCA – 306**

(Following Paper ID and Roll No. to be filled in your Answer Book)										
PAPER ID : 1434	**Roll No.**									

MCA

THIRD SEMESTER EXAMINATION, 2005-2006

COMPUTER BASED OPTIMIZATION TECHNIQUES

Time : 3 Hours *Total Marks : 100*

Note : *(i) Answer **ALL** questions.*

(ii) All questions carry equal marks.

(iii) In case of numerical problems assume data wherever not provided.

(iv) Be precise in your answer.

1. Attempt ***any two*** of the following questions : **(10x2=20)**

(a) State important applications of inventory models. A particular item has a demand of 9,000 units/year. The cost of one procurement is Rs. 100 and the holding cost per unit is Rs. 2.40 per year. The replacement is instantaneous and no shortages are allowed. Determine :

(i) the economic lot size

(ii) the number of orders per year

(iii) optimum scheduling period

(iv) the total cost per year if the cost of one unit is Rs. 1.

(b) Find the optimal order quantity for which the price breaks are as follows :

Quantity	Unit Cost (Rs.)
$0 < q < 500$	Rs. 10
$500 \leq q < 750$	Rs. 9.25
$750 \leq q$	Rs. 8.75

The monthly demand for the product is 200 units, shortage cost is 2% of the unit cost and cost of ordering is Rs. 100.

(c) In a company the machine M_1 is replaced after every three years while the machine M_2 in twice as many years. Given below the yearly costs of both the machines.

Year :	1	2	3	4	5	6
M_1 :	1000	200	400	1000	200	400
M_2 :	1700	100	200	300	400	500

Take the value of money as 10% and find out which machine should be purchased ?

2. Attempt *any two* of the following questions : **(10x2=20)**

(a) State some important applications of L.P.P.. Express the following L.P.P. in the standard form :

Determine x_1, x_2, x_3, so as

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $2x_1 + 3x_2 - 2x_3 \leq 40$

$4x_1 - 2x_2 + x_3 \leq 24$

$x_1 - 5x_2 - 6x_3 \geq 2$

$x_1 \geq 0$

(b) Use two-phase simplex method to

Minimize $Z = x_1 + x_2$

Subject to $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

$x_1, x_2 \geq 0$

(c) Use dual simplex method to

Minimize $Z = 3x_1 + x_2$

Subject to $x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

$x_1, x_2 \geq 0$

3. Attempt *any four* of the following questions : **(5x4=20)**

(a) Explain two practical applications of $0-1$ integer linear programming problem.

(b) State Cutting Plane Algorithm for solving mixed integer programming problem.

(c) State important applications of transport problem models.

(d) Obtain an initial basic feasible solution to the following transportation problem using the matrix minima method.

	1	2	3	4	Supply
1	10	2	20	11	15
2	12	7	9	20	25
3	4	14	16	18	10
Demand	5	15	15	15	

(e) Use column minima method to find initial basic feasible solution to the transportation problem :

	1	2	3	4	Supply
1	2	3	11	7	6
2	1	0	6	1	1
3	5	8	15	9	10
Demand	7	5	3	2	

(f) Solve maximal assignment problem given below :

	I	II	III	IV
A	42	35	28	21
B	30	25	20	15
C	30	25	20	15
D	24	20	16	12

4. Attempt *any two* of the following questions : **(10x2=20)**

(a) What do you mean by convex programming problem ? Describe a method to solve it.

(b) State Bellman's principle of optimality in D.P. Also write dynamic programming algorithm to solve a multi-stage decision problem.

(c) Use dynamic programming to solve the LPP :

Maximize $Z = 6x_1 + 7x_2$

Subject to $2x_1 + 3x_2 \leq 12$

$2x_1 + x_2 \leq 8$

$x_1, x_2 \geq 0$

5. Attempt *any four* of the following questions : **(5x4=20)**

(a) Explain the basic elements of queuing models.

(b) State the basic axioms governing Poisson queues. Find the distribution of arrivals for the Poisson queues.

(c) State one memoryless distribution and discuss its role in the queuing modeling.

(d) Explain the following terms used in the queuing theory :

(i) Steady and transient state

(ii) Queue discipline

(e) A bank has only one typist. The typing is randomly distributed approximating a exponential distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8-hour day. The interarrival time follows an exponential distribution. If the typewriter is valued at Rs. 1.50 per hour, determine :

(i) Equipment utilization

(ii) The percent time that an arriving letter has to wait.

(iii) Average cost due to waiting on the part of typewriter.

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(f) Consider a one-server queuing situation in which the arrival and service rates are given by :

$$\lambda_n = 10 - n, \quad n = 0, 1, 2, 3$$

$$\mu_n = \frac{n}{2} + 5, \quad n = 1, 2, 3, 4$$

(i) Set the transition diagram and determine the balance equation for the system.

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